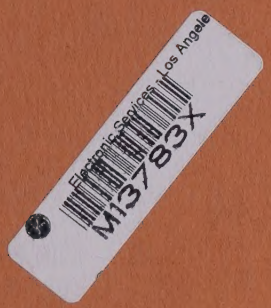
S1075B

GENERAL ELECTRIC CO.
Instrumentation & Control
228 W. Florence Ave.
Inglewood, Calif. 90301



MOTOROLA PRECISION INSTRUMENTS

Deviation Monitor/ Frequency Synthesizer

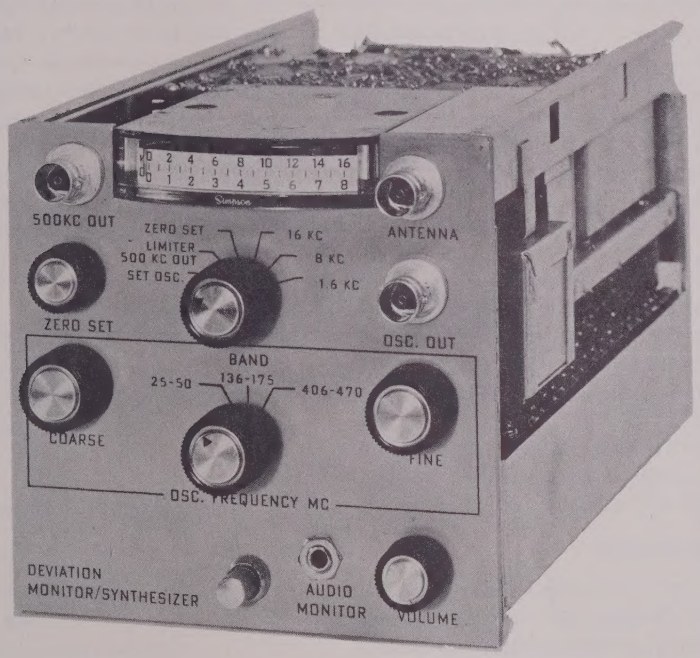
MODEL S1079A

68P81045A60-A

MOTOROLA

DEVIATION MONITOR/ FREQUENCY SYNTHESIZER

MODEL S1079A



Model S1079A
Deviation Monitor/Frequency Synthesizer

MOTOROLA INC. **Communications Division**

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68P81045A60
Issue - A

GUARANTEED PERFORMANCE SPECIFICATIONS

MODEL	S1079A Deviation Monitor/Synthesizer
FREQUENCY RANGES:	25-50 mc, 136-175 mc, 406-470 mc
METER RANGES:	Full scale readings of 1.6 kc, 8 kc, 16 kc.
ACCURACY:	
1.6 kc range:	±10% of full scale (for tones to 400 cps)
8 kc range:	±5% @ 5 kc to 6.67 kc (otherwise 5% of full scale)
16 kc range:	±5% @ 15 kc (otherwise 5% of full scale)
SENSITIVITY:	5 millivolts or less on all frequency ranges.
DEVIATION READING:	1/2 x sum of positive and negative peaks.
SIGNAL OUTPUT LEVEL:	100 millivolts minimum
SIGNAL OUTPUT RANGES:	25-50 mc, 136-175 mc, 406-470 mc
TEMPERATURE RANGE	0°C to +50°C
IF FREQUENCY OUTPUT	500 kc at 100 millivolts minimum.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

FOREWORD

CLAIM FOR DAMAGE IN SHIPMENT

If any damage to the shipping container is apparent upon receipt, the delivering driver should be requested to note such damage on all copies of the freight bill. This is for your protection should the material have received damage.

The equipment should be unpacked immediately, examined for damage and tested. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. The claim should be filed within 48 hours after receipt, if possible, or during a period not to exceed 15 days.

A full report of such damage should be obtained from the claim investigator, who will call upon you. For the purpose of this report, the shipping container and all packing materials should be retained for the investigator to examine.

The investigator's report should then be forwarded to:

Motorola Communications &
Electronics, Inc.
Parts and Service Department
1875 Greenleaf Avenue
Elk Grove Village, Illinois 60007

Include model number and serial number when referring to the instrument for any reason. Arrangements for repair or replacement will be made and you will be advised of the disposition of the instrument.

REPAIR AND/OR RECALIBRATION

Because of its complexity it is recommended that the instrument be returned to the factory for repair and/or calibration. Return to:

Motorola Communications &
Electronics, Inc.
Parts and Service Department
1875 Greenleaf Avenue
Elk Grove Village, Illinois 60007

for repair and/or recalibration. Before shipping the instrument notify the Parts and Service Department at the above address of the service required. Refer to the instrument by model number and serial number. On receipt of the information, you will be informed of shipping instructions. If requested, an estimate of the charges will be made before work begins, provided the instrument is not covered by the warranty.

SHIPPING

The unit employs a meter movement which, though electrically rugged, should be protected from mechanical shock. Therefore, the instrument should be surrounded by three inches of excelsior or similar absorbing material and then packed in a strong exterior container. It should be shipped via truck, railway express, air freight, or air express. The instrument should not be handled roughly during packing.

WARRANTY

This Motorola instrument is guaranteed by Motorola for a period of one year after delivery to the original purchaser against defects in design, material, and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory Service Department for that purpose and to replace any defective parts thereof.

This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination it is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at the net price of necessary parts and a service charge at Motorola's then prevailing labor rate. In this case, an estimate will be submitted before the work is started.

This warranty is in lieu of all other warranties, expressed or implied and all other obligations or liabilities on Motorola's part.

If any fault develops, the following steps should be taken:

1. Notify us at the following address:

   Motorola Communications &
   Electronics, Inc.
   Parts and Service Department
   1875 Greenleaf Avenue
   Elk Grove Village, Illinois 60007

   Give full details of the difficulty, and include model number and serial number. Upon receipt of this information, we will give you service data or shipping instructions.

2. Upon receipt of shipping instructions, forward the instrument prepaid to the above address, or to the authorized repair station indicated on the instructions. If requested, an estimate of the charges will be made before the work begins, if the instrument is not covered by the warranty.

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1. INTRODUCTION

The Model S1079A Deviation Monitor/Synthesizer is a plug-in unit that provides deviation monitoring features when installed in the Motorola Model S1075 Series Digital Frequency Meter. The Model S1079A is available as a separate item for field installation in existing Model S1075 Series Digital Frequency Meter. When the Model S1079A is factory installed in the Model S1075B, the combination makes up the Model S1078A Digital Frequency Meter and Deviation Monitor. The Model S1075B is described in detail in a separate instruction manual.

2. DESCRIPTION

With the Model S1079A installed in the S1075 Series Meter, the frequency and deviation of a radio transmitter may be measured and signals of high accuracy may be generated for alignment purposes. Audio from the equipment under test may be monitored aurally through a built-in speaker with output for visual display available from a phone jack.

3. INSTALLATION IN S1075 SERIES DIGITAL FREQUENCY METER

a. Panel Removal

Remove the blank panel from the lower left front panel of the frequency meter, by turning the thumbscrew counterclockwise until the latch dog disengages and the panel lifts up and out.

b. Power Cable Connections

(1) Free the power cable from its restraints inside the opening and bring the plug on the end of the cable outside of the meter.

(2) Plug the cable into the mating receptacle on the monitor/synthesizer, and secure the cable in place with the loop clamp near the cable receptacle. On frequency meters equipped with a flat ribbon type of cable, it will be necessary to roll the ribbon into a cylindrical shape to fit into the loop clamp. In either case, the cable must be secured in the clamp as shown in Figure 1. When the monitor/synthesizer is in place in the frequency meter, this cable is in close proximity to hot components. If improperly secured, the cable may be damaged by these components or by pinching between the chassis.

c. Mounting in Cabinet

Insert the S1079A Deviation Monitor /Synthesizer into the slide rails in the frequency meter. Slide the unit into the case and secure by turning the thumbscrew latch clockwise.

d. Intercabling

The SKN6011A Intercable Kit includes the coaxial cables supplied with the Model S1079A. These cables connect between receptacles on the monitor/synthesizer, the frequency meter and the equipment under test.

4. OPERATION

a. Operating Controls

(1) Function Switch

(a) SET OSC

This switch position is used while setting the frequency of the local oscillator. With the VOLUME control set at a suitable level, the 100 kc frequency changes occurring as the COARSE frequency control is rotated will be heard as clicks in the speaker.

(b) LIMITER - 500 KC OUTPUT

This switch position connects the limiter of the 500 kc i-f amplifier contained in the monitor/synthesizer to the front panel meter. With the switch in this position, adequate transmitter input for measurements will be indicated by the panel meter reading at least to the red 6 and 3 kc mark. In this position, the 500 kc output plus or minus the transmitter frequency error is available from the 500 KC OUT jack. Audio output is available from the deviation amplifiers at the speaker and the AUDIO MONITOR jack.

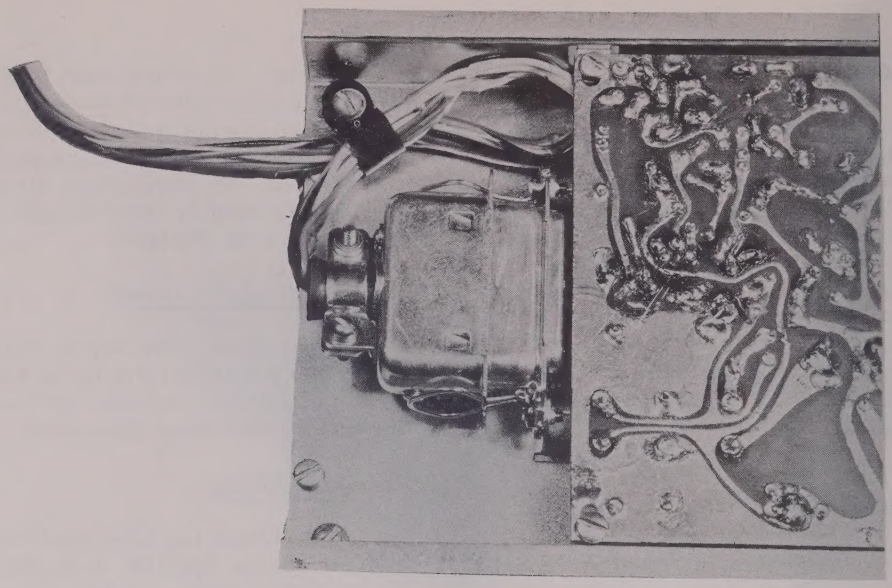


Figure 1.
Cable Securing Detail

(c) ZERO SET

With the switch in this position, the ZERO SET control is used to electrically zero the panel meter for correct deviation readings. Audio output is not available when the switch is in this position.

(d) 16 KC

Measurements of deviation up to 16 kc may be made with the switch in this position. For measurement of lesser deviations, use another switch position.

(e) 8 KC

Deviation up to 8 kc may be measured with the function switch in this position. For greater deviations, the 16 KC position must be used; for lesser deviation, the 1.6 KC switch position may be used.

(f) 1.6 KC

Deviation measurements up to 1.6 kc may be made with the switch in this position. Actual deviation is indicated by meter readings between 60 and 400 cps; deviation readings above 400 cps will be less than the actual transmitter deviation. This switch range is intended for use when measuring "Private-Line" tone deviation. In this position, as well as in the 16 and 8 kc positions, the audio output is derived from the transmitter deviation.

(2) BAND Switch

(a) 25-50 position

In this switch position, the local oscillator frequency of the monitor/synthesizer may be varied between 25 mc and 50 mc by the COARSE and FINE controls.

(b) 136-175 position

This position of the BAND switch sets the range of the oscillator to cover 136 to 175 mc by adjustment of the COARSE and FINE controls.

(c) 406-470 position

The local oscillator may be tuned over the 406 to 470 mc range by the COARSE and FINE controls with the BAND switch in this position.

(3) COARSE Tuning Control

This control, a 10-turn precision potentiometer, varies the frequency of the local oscillator in 100 kc steps on the three frequency bands. Rotating the control clockwise raises the oscillator frequency, while rotating the control counterclockwise lowers the frequency.

(4) FINE Tuning Control

This control adjusts the frequency of the local oscillator in the monitor/synthesizer

in five kc steps in each of the three frequency bands available on the unit.

(5) ZERO SET Control

This control is used to electrically zero the panel meter before making deviation measurements. When properly set, the control balances the output between the positive and negative deviation peak detectors.

(6) VOLUME Control

This control adjusts the output level of the audio from both the internal speaker and the AUDIO MONITOR jack.

(7) AUDIO MONITOR Jack

This jack is connected in parallel with the internal speaker. An output may be taken from this jack for further amplification or for display on an oscilloscope. The output level is controlled by the VOLUME control. Do not connect to a load with an impedance of less than 300 ohms.

(8) ANTENNA Jack

This jack is used as an input to the monitor when the antenna supplied with the frequency meter is attached. This same set-up may be used to radiate a signal from the local oscillator. This signal level will be approximately 20 db lower than from the output of the OSC. OUT jack.

(9) OSC. OUT Jack

This jack will deliver a minimum of 100 millivolts output from the local oscillator in the 25-50, 136-175, and 406-470 mc bands. An output may be fed from this jack to the appropriate frequency meter input to count the oscillator frequency or, with an antenna connected, a signal may be radiated to a receiver for alignment purposes.

(10) 500 KC OUT Jack

When the function switch is in the LIMITER-500 KC OUT position, a 500 kc plus or minus the transmitter frequency error signal is available from this jack. The associated frequency counter may be used in any of its resolution positions.

b. Signal Inputs

For normal deviation measurements, the antenna furnished with the S1075 Series Frequency Meter should be connected to the ANTENNA input jack. Adequate signal input is indicated by a reading at or greater than the red 6 and 3 kc marks on the panel meter with the function switch in the LIMITER-500 KC OUT position. In very strong signal areas, the counter reading of the local oscillator will be disturbed when the transmitter is keyed. If this condition should occur, there is sufficient signal strength to make deviation measurements with the antenna removed from the ANTENNA jack.

c. Setting the Local Oscillator Frequency

Connect the OSC. OUT jack on the monitor/synthesizer to the appropriate input jack on the S1075 Series Frequency Meter. Turn the BAND switch to the desired band. Turn the function switch to the SET OSC. position. Set the frequency meter for 100 cps resolution and minimum display time. Rotate the FINE frequency control to obtain the desired 10,000 and 1,000 cps digits. Rotate the COARSE frequency control to obtain the 10 mc, 1 mc and 100 kc digits.

Example:

To check the deviation of a transmitter operating on 150.955 mc, the deviation monitor/synthesizer should be set to a frequency of 151.455 mc, which is 500 kc above the transmitter frequency.

To set the monitor oscillator frequency, connect the OSC. OUT jack to the 2 V MAX 105-175 MC input on the frequency meter heterodyne unit. Connect the OUTPUT jack of the heterodyne unit to the INPUT jack of the frequency meter. Set the deviation monitor/synthesizer BAND switch to the 136-175 mc position.

The counter will display some frequency, say 172.005 mc. Rotate the FINE control to set up the last two digits of the desired frequency (151.455 mc). In this example, if the frequency 172.055 mc cannot be reached before reaching the end of the tuning range, reverse the direction of tuning and tune for 171.955 mc. Now rotate the COARSE frequency control counterclockwise until 151.455 mc appears. A more stable output is available from the local oscillator when the COARSE and FINE tuning controls are in the middle of their respective tuning ranges for a particular locked frequency. After changing to another frequency, the tuning controls will not be centered in their tuning range. Rotating the controls slightly in a direction opposite to the one used to obtain the desired frequency will bring the controls to the center of of their tuning range. If the 100 kc step of the

local oscillator indication becomes unstable after a mechanical shock, or if the meter reading restabilizes at a different frequency during a measurement, readjust the local oscillator to the desired frequency.

d. Measuring Transmitter Deviation and Frequency Error

(1) Connect the antenna supplied with the frequency meter to the ANTENNA input jack.

(2) Set the function switch on the deviation monitor to the SET OSC. position.

(3) Set the local oscillator to ±500 kc of the transmitter frequency as described in Setting the Local Oscillator Frequency.

(4) Set the function switch to the LIMITER-500 KC OUT position. Key the transmitter and observe the reading on the meter. If the meter reads above the red markings at 3 and 6 KC, the input from the transmitter is adequate for measurement.

(5) To measure the transmitter frequency, connect the 500 KC OUT jack to the S1075 Series Frequency Meter INPUT jack and set the RESOLUTION switch to the desired frequency resolution. Key the transmitter and observe the frequency displayed on the frequency meter. The difference between the displayed frequency and 500 kc is the actual frequency error.

NOTE

For transmitters with channel elements, a frequency error will be present which is dependent on the temperature of the channel element. In these cases, consult the transmitter instruction manual for frequency adjustment information.

(6) To adjust the transmitter for zero frequency error, key the transmitter and adjust the transmitter oscillator until the S1075 Series Frequency Meter reads 500 kc. Where it is desired to compensate for the frequency error due to temperature characteristics of the channel element, it will be necessary to know whether the local oscillator in the S1079A is set above or below the transmitter frequency in order to offset the frequency in the proper direction. If the local oscillator is set below the transmitter frequency, raising the transmitter frequency will increase the counter reading. If the local oscillator is above the transmitter frequency, raising the transmitter frequency will decrease the counter frequency.

NOTE

If the 500 kc reading is unstable, it is possible that the local oscillator is not locked. Readings approximately 100 kc away from the desired 500 kc reading indicate that the local oscillator has shifted 100 kc.

(7) It is normally not necessary to adjust the transmitter frequency before making a deviation measurement, as no error will occur unless the transmitter frequency is more than 4 kc removed from the correct value.

To measure transmitter deviation, move the deviation monitor function switch to the ZERO SET position and adjust the meter to zero with the ZERO SET control.

(8) Now set the function switch to the appropriate range (16 kc, 8 kc, or 1.6 kc) for the transmitter deviation to be measured. When using the 1.6 kc range, the transmitter should be keyed, as noise will produce a full-scale reading. Use sine-wave modulation for the most accurate measurement.

e. Receiver Frequency Adjustment

NOTE

Before adjusting the receiver 1st oscillator to set the receiver on frequency, it is recommended that the primary and secondary of the discriminator transformer in the 455 KC IF Amplifier be aligned with the 455 kc output from a Motorola S1056-9A Portable Test Set.

(1) Connect the OSC. OUT jack on the deviation monitor to the appropriate input jack on the S1075 Series Frequency Meter.

(2) Place the test antenna on the OSC. OUT jack or the ANTENNA terminal (20 db lower), depending on the signal strength required to quiet the receiver under test.

(3) With the portable test set connected to the receiver, adjust the receiver 1st oscillator for a zero reading in test set position number 4. When the meter reads zero, the receiver is tuned to the frequency set on the deviation monitor/synthesizer.

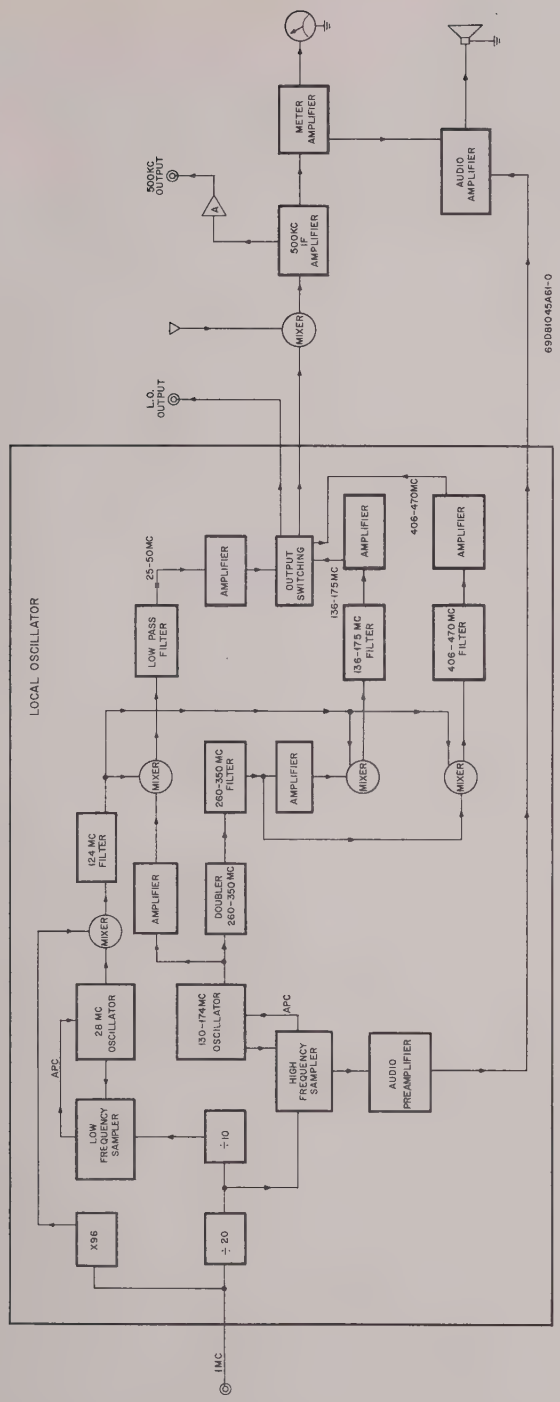


Figure 2.
Block Diagram

f. Self-Quieting Spurious Oscillations

With the function switch in the LIMITER-500 KC OUT, 16 KC, 8 KC or 1.6 KC positions, quieting of the internal 500 kc i-f strip may be heard at some settings of the local oscillator frequency controls on the deviation monitor/synthesizer. In cases where an actual transmission is not being received, a spurious signal from the local oscillator is quieting the i-f amplifier. In all cases, however, the level of the spurious signal will be below the 5 millivolt sensitivity level of the mixer. Therefore, if a spurious signal should fall on a frequency desired for measurement of transmitter deviation, no problem exists, because the transmitter signal will capture the receiver so that measurements may be made without difficulty.

5. THEORY OF OPERATION – MODEL S1079A

a. General

The Model S1079A Deviation Monitor/Synthesizer contains circuitry for generation of local oscillator signals by frequency synthesis, and other circuits for measurement of frequency deviation. The deviation measuring circuitry includes mixer, 500 kc i-f amplifier, deviation meter amplifier, and audio output stages.

b. Deviation Measurement

The monitor/synthesizer is a single-conversion FM receiver with a tunable local oscillator. RF signals entering the antenna are heterodyned with the output of the local oscillator in the transistor mixer to produce a 500 kc intermediate frequency containing the modulation on the input signal. This 500 kc signal is passed through three amplifier and two limiter stages, then to the discriminator where the audio is recovered. The output is amplified through two stages with negative feedback. The amplifier output is fed to the detector stages where the peak deviation is detected irrespective of the waveform. These detector stages have a fast charge and slow discharge characteristic to enable detection of voice modulation. The output of the detectors is measured by a peak reading voltmeter which is calibrated to read half of the peak-to-peak deviation.

c. Multiplier-Divider Board

The digital divider portion of this board receives a 1 mc input from the high stability oscillator in the S1075 Series Frequency Meter. This 1 mc input is divided by 10 for an output of 100 kc. The 100 kc output is divided by 2 to produce a 50 kc output which is then divided by 10 to produce a 5 kc output.

The 100 kc and 50 kc outputs are connected to the BAND switch. The 100 kc output is used by the high frequency (130-174 mc input) sampler circuit for 25-50 mc operation. The 50 kc output is used for 136-175 mc and 406-470 mc operation. The 5 kc output is connected to the low frequency (28 mc) sampler circuit.

The multiplier portion of the board raises the frequency of the high stability oscillator input 96 times with multiplier stages of X4, X4, X3, and X2 all of which are double tuned. The 96 mc output is mixed with the output of the 28 mc oscillator to produce a 124 mc output.

d. 28 MC Oscillator

The 28 mc oscillator is an LC oscillator with a varactor controlled tuning range of approximately 120 kc. The oscillator is locked to the 1 mc frequency standard, but can be changed in 5 kc steps with the FINE frequency control. Locking is accomplished with an automatic phase control loop.

e. 130-174 MC Oscillator

This oscillator is a broadband, varactor-controlled LC device with automatic phase locking to the 1 mc frequency standard. The COARSE frequency control varies the oscillator frequency in 100 kc steps in the 25-50 mc band, and in 50 kc steps in the 136-175 and 406-470 mc bands, although the actual local oscillator output varies in 100 kc steps.

f. High and Low Frequency Sampler Circuits

The high frequency sampler circuit delivers an output to the automatic phase control (APC) loop which locks the 130-174 mc oscillator to a multiple of 50 or 100 kc. The digital divider output of 50 or 100 kc provides the timing input to the sampling circuit. The square wave input is differentiated and fed into an avalanche breakdown transistor which provides both a positive and a negative pulse output of less than 5×10^{-9} second duration. The short positive and negative pulses open the diode bridge. This allows the other input to the bridge, a 130-174 mc oscillator signal, to pass through the bridge and charge the 5 uuf capacitor. Depending on the frequency of the

oscillator input, the capacitor may be charged positively or negatively. If the pulses and the zero crossing of the oscillator input occur simultaneously, there will be no output from the bridge, and the oscillator will be on frequency. If the zero crossing does not coincide in time with the pulses, an error output will be registered on the 5 uuf capacitor, amplified, and then fed back to the oscillator through the APC loop. The frequency of the oscillator is corrected each time an input occurs to the avalanche transistor. As a result, 50 or 100 thousand corrections per second are made to the high frequency oscillator.

The low frequency sampler circuit delivers an output to the APC loop which controls the locking of the 28 mc oscillator to a multiple of 5 kc. The timing input to the avalanche transistor is the 5 kc output from the digital dividers. The short positive and negative pulses from the avalanche breakdown transistor open the diode bridge. A positive or negative charge, depending on the exact frequency of the 28 mc input to the bridge will be placed on the 22 uuf capacitor on the bridge output. This error output is amplified by an insulated gate field-effect transistor, and is sent back to the varactor-controlled 28 mc LC oscillator through a low-pass filter.

g. RF and Filter Module

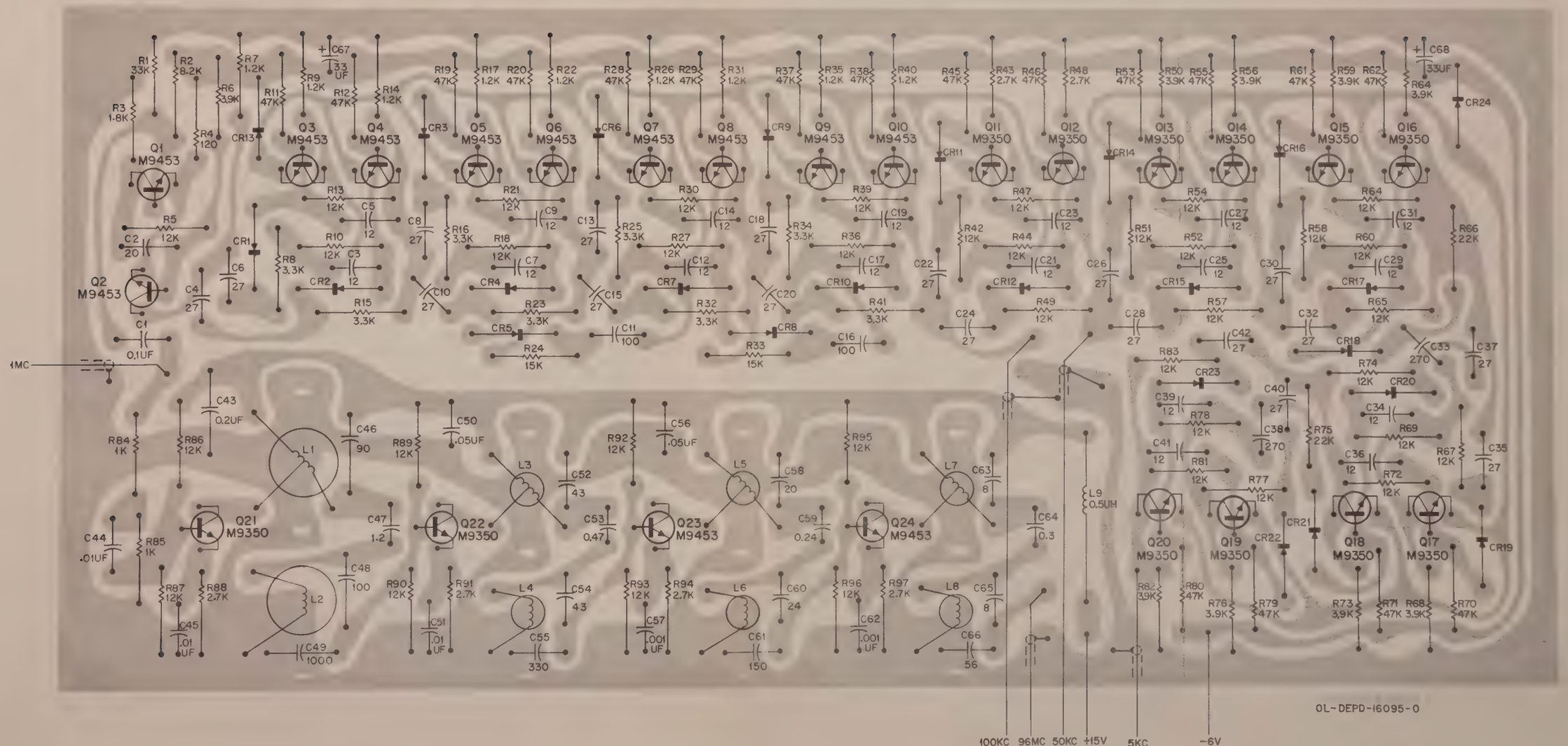
The r-f module synthesizes the three r-f bands of the local oscillator from the 96 mc, 28 mc, and 130-174 mc inputs. The 28 and 96 mc inputs are combined in the 124 mc mixer to provide a 124 mc output. The mixer is connected to a 124 mc narrow-band filter, whose output is directed to three separate mixers which provide the three r-f output bands. The three bands are then synthesized from the 124 mc signal, adjustable in 5 kc steps, and from the 136-174 mc LC oscillator output, which is adjustable in 50 or 100 kc steps, depending on the frequency band.

To generate a signal in the 25-50 mc band, the LC oscillator output in the 149-174 mc range is amplified and fed to a mixer with the 124 mc signal. The output of the mixer passes through a low-pass filter to recover the 25-50 mc band. The 25-50 mc signal is then amplified and fed through a switched output to the local oscillator output and mixer.

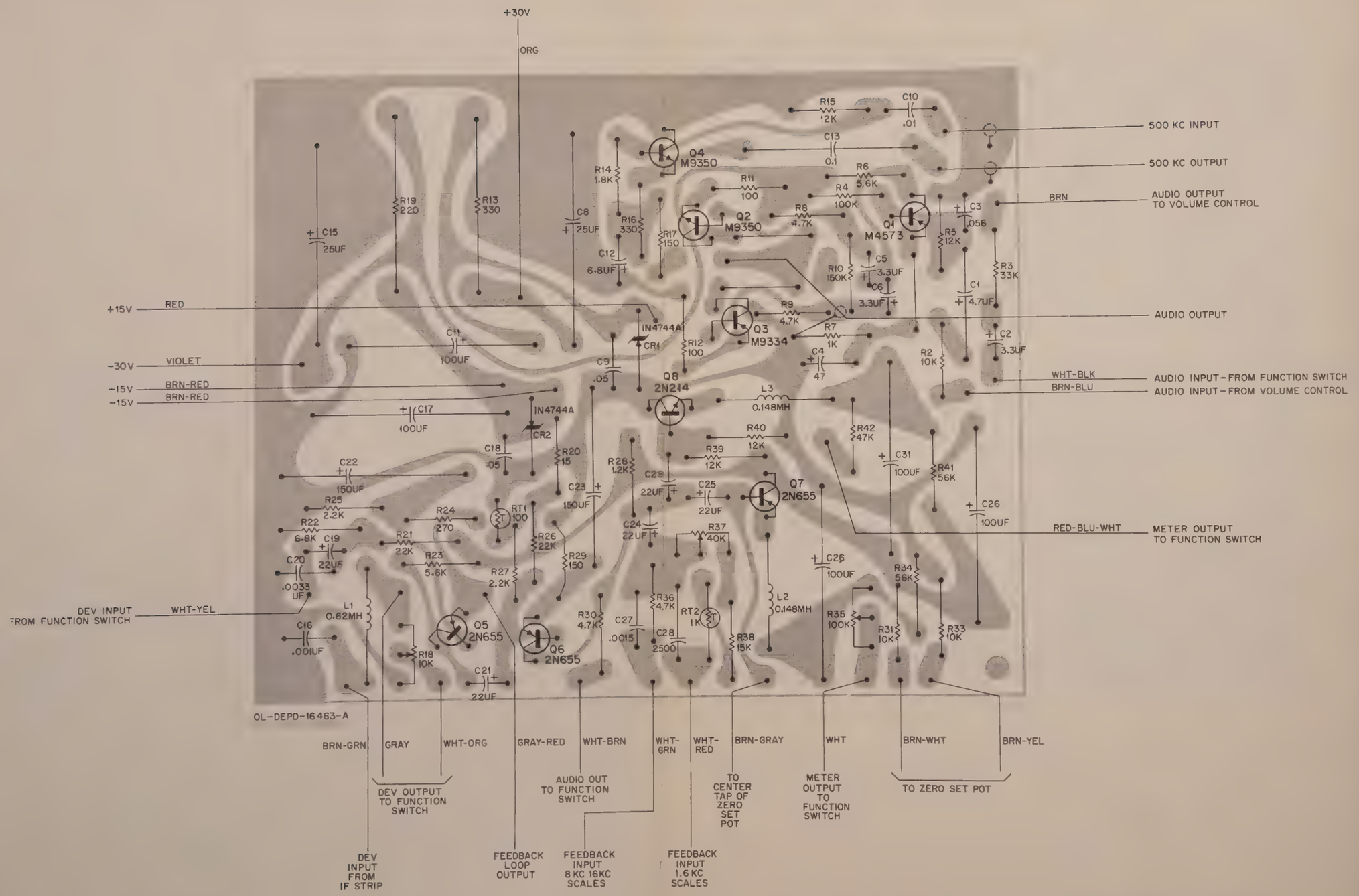
To generate a signal in the 136-175 and the 406-470 mc bands, it is necessary to double the LC oscillator frequency output in the range from 130-173 mc to 260-346 mc. The multiplication is done in two stages. The first stage amplifies the 130-173 mc signal, and the second stage doubles the frequency to the 260-346 mc range. The output from the second stage is fed through a 260-350 mc bandpass filter.

This 260-350 mc signal is amplified and fed to a mixer along with the 124 mc signal. The 136-175 mc signal is generated by mixing the 260-299 mc portion of the 260-350 mc signal with the 124 mc signal. The output of the mixer is sent through a 136-175 mc bandpass filter. The signal is then amplified and fed through a switched output to the local oscillator output and mixer.

The 406-470 mc signal is generated by mixing the 282-346 mc portion of the output of the 260-350 mc bandpass filter with the 124 mc signal. The output of the mixer is passed through a 406-470 mc bandpass filter. The signal is then amplified in a three stage broadband amplifier and fed through a switched output to the local oscillator output and mixer.



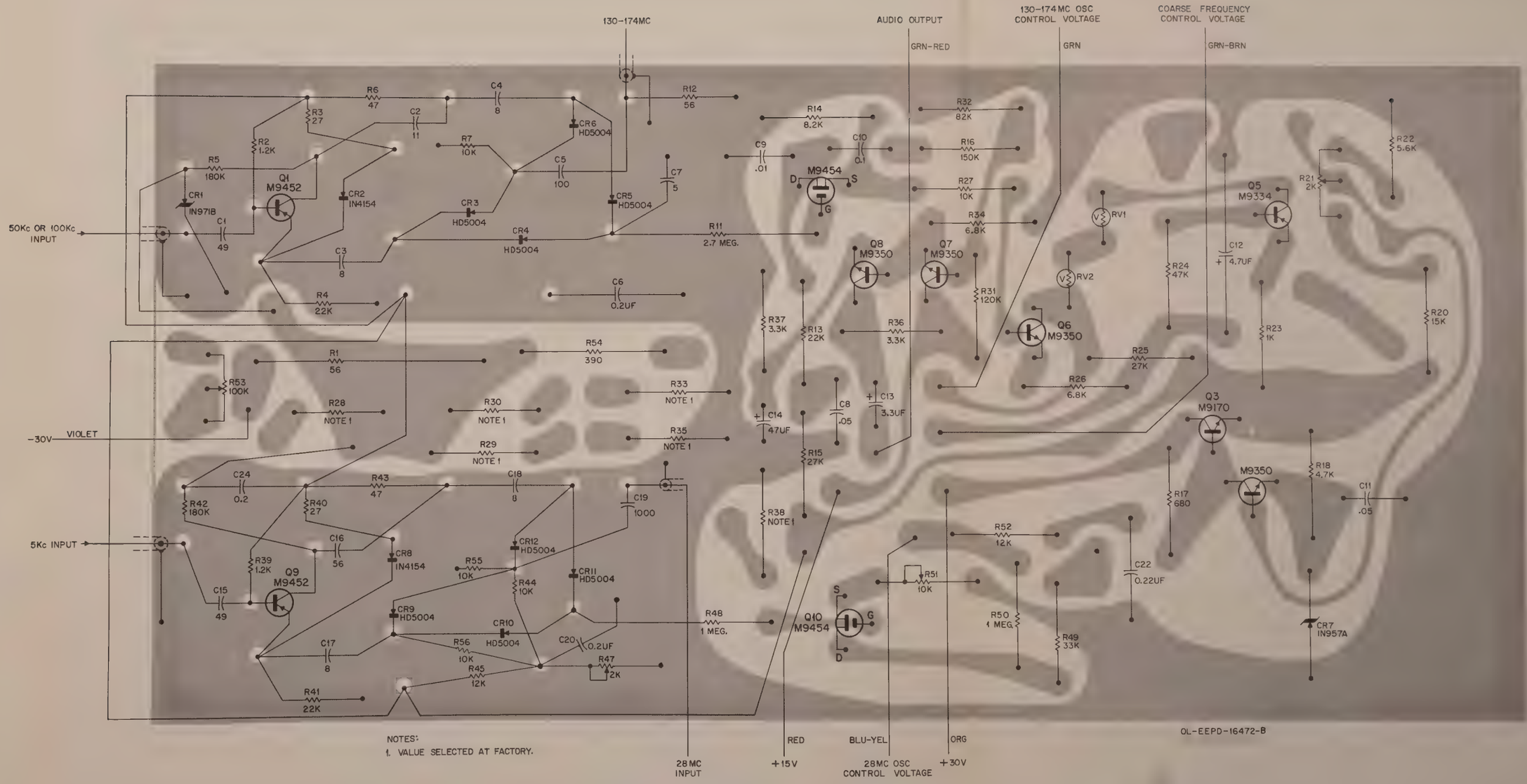
Model SLN6216A
Multiplier-Divider Board
Printed Circuit Board Detail
Motorola No. PEPD-16093-O
8/19/66-UP



Model SLN6217A
Deviation Amplifier
Printed Circuit Board Detail
Motorola No. PEPD-16461-A
5/25/67-UP

REVISIONS

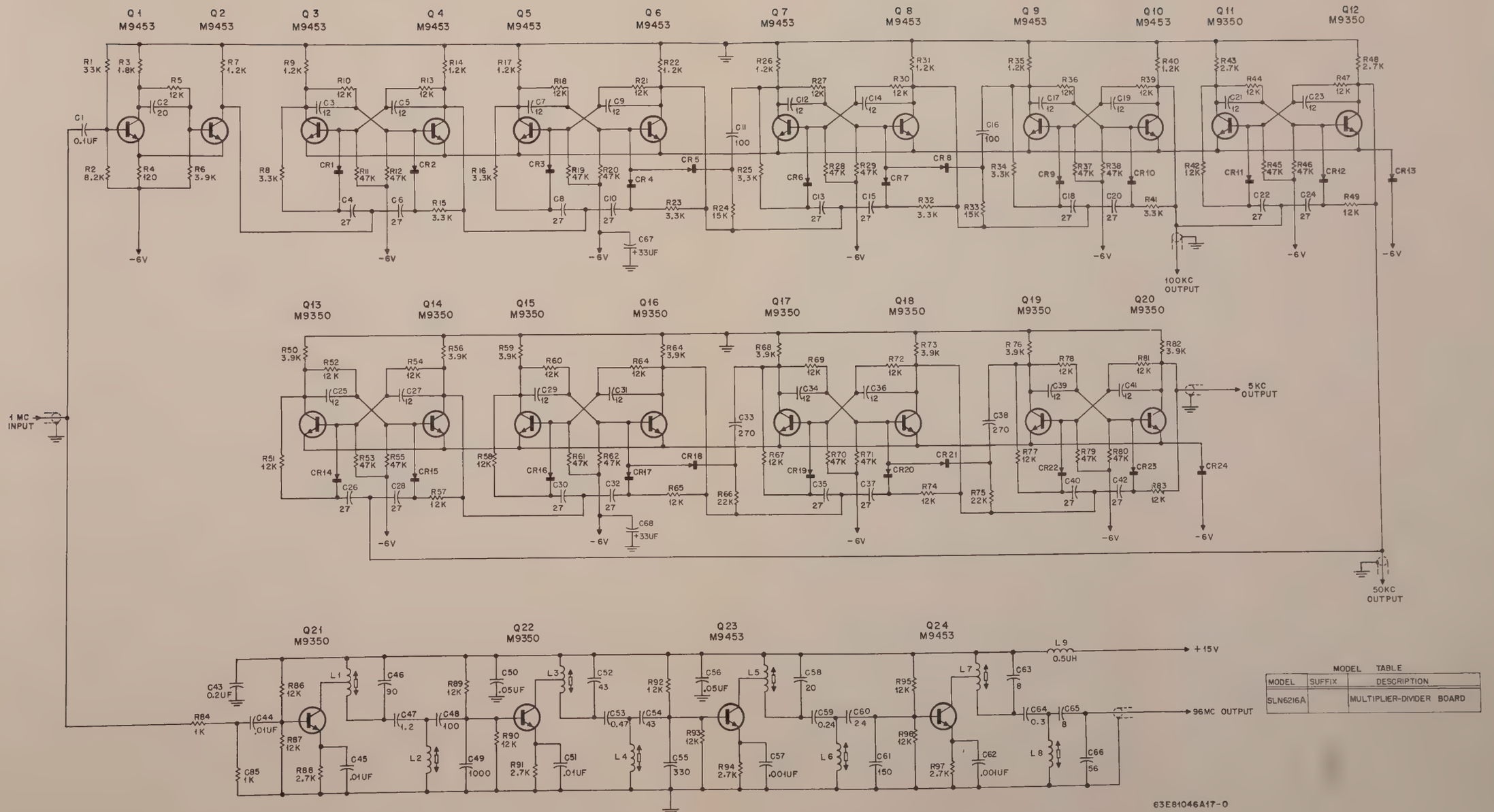
DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	SLN6217A	C7	REMOVED 15 uf, WAS CONNECTED BETWEEN Q3 COLLECTOR AND AUDIO OUTPUT	Q3 COLLECTOR



NOTES:
1. VALUE SELECTED AT FACTORY.

Model SLN6215A Sampler
Printed Circuit Board Detail
Motorola No. PEPD-16470-B
5/25/67-UP

Model SLN6058A
500 KC IF Board
Printed Circuit Board Detail
Motorola No. PEPD-18935-O
5/25/67-UP

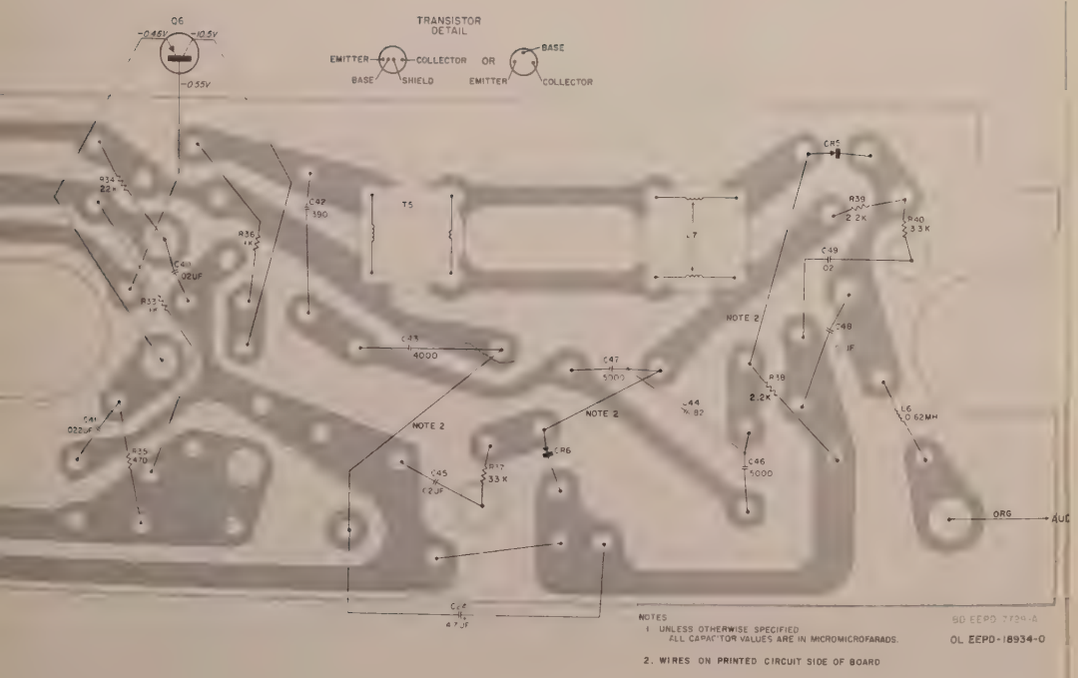


MODEL TABLE		
MODEL	SUFFIX	DESCRIPTION
SLN6216A		MULTIPLIER-DIVIDER BOARD

NOTES :
1. ALL RESISTORS ARE IN OHMS, ±10%, 1/4 WATT. ALL CAPACITORS ARE IN MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Model SLN6216A
Multiplier-Divider
Schematic Diagram
Motorola No. 63E81046A17-O
8/19/66-UP



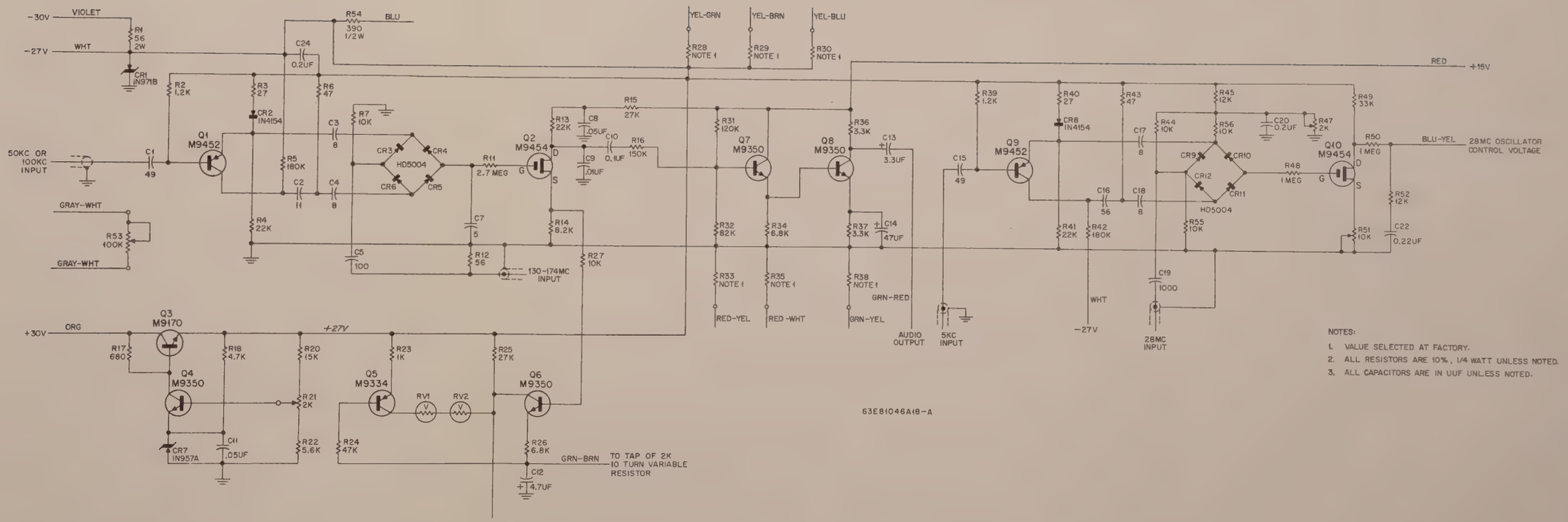
PARTS LIST for Schematic Diagram 63E81046A17-O

SLN6216A Multiplier-Divider Board

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf ±10%; 500 v; unl. stated
C1	21C82372C01	.1 uf +80-20%; 25 v
C2, 58	21K840849	20 ±5%
C3, 5, 7, 9, 12, 14, 17, 19, 21, 23, 25, 27, 29, 31, 34, 36, 39, 41	21D82133G02	12 ±5%; NP0
C4, 6, 8, 10, 13, 15, 18, 20, 22, 24, 26, 28, 30, 32, 35, 37, 40, 42	21D82133G23	27, NP0
C11, 16, 48	21K850118	100 ±5%
C33, 38	21C82187B22	270; 200 v
C43	21C82372C02	.2 uf +80-20%; 25 v
C44, 45, 51	21D82428B03	.01 uf -30+70%; 100 v
C46	21K865941	90 ±2%; 300 v
C47	21C82450B08	1.2 ±5%
C49, 57, 62	21C82187B14	1000; 100 v
C50, 56	21C82372C04	.05 uf +80-20%; 25 v
C52, 54	21D82537B07	43 ±5%
C53	21C82450B24	.47
C55	21K874351	330; 300 v
C59	21C82450B05	.24
C60	21K840365	24 ±5%; NP0
C61	21K840047	150 ±5%
C63, 65	21K847743	8 ±.5%; NP0
C64	21K830201	.3 ±5%
C66	21D82133G35	56 ±5%; NP0
C67, 68	23D82397D18	33 uf; 10 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23	48C847274	germanium
CR13, 24	48C82466H01	rect.; silicon
		COIL, RF:
L1	24B83111E02	40 turns
L2	24B83111E01	40 turns
L3	24D82597C23	35-1/2 turns
L4	24D82597C22	35-3/4 turns
L5	24D82597C21	11-1/2 turns
L6	24D82597C20	11-3/4 turns
L7	24D82597C19	10 turns
L8	24D82597C18	10 turns
L9	24K859167	choke; .05 uh
		TRANSISTOR: (SEE NOTE)
Q1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 23, 24	48R869453	N-P-N; type M9453
Q11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22	48R869350	N-P-N; type M9350
		RESISTOR: ±10%; 1/4 w: unl. stated
R1	6S127807	33K
R2	6S128686	8.2K
R3	6S129269	1.8K
R4	6S129617	120
R5, 10, 13, 18, 21, 27, 30, 36, 39, 42, 44, 47, 49, 51, 52, 54, 57, 58, 60, 63, 65, 67, 69, 72, 74, 77, 78, 81, 83, 86, 87, 89, 90, 92, 93, 95, 96	6S129230	12K
R6, 50, 56, 59, 64, 68, 73, 76, 82	6S129232	3.9K
R7, 9, 14, 17, 22, 26, 31, 35, 40	6S129235	1.2K
R8, 15, 16, 23, 25, 32, 34, 41	6S129231	3.3K
R11, 12, 19, 20, 28, 29, 37, 38, 45, 46, 53, 55, 61, 62, 70, 71, 79, 80	6S128902	47K
R24, 33	6S127805	15K
R43, 48, 88, 91, 94, 97	6S128688	2.7K
R66, 75	6S128685	22K
R84, 85	6S127802	1K

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



NOTES:

1. VALUE SELECTED AT FACTORY.
2. ALL RESISTORS ARE 10%, 1/4 WATT UNLESS NOTED.
3. ALL CAPACITORS ARE IN UUF UNLESS NOTED.

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Model SLN6215A Sampler
Schematic Diagram
Motorola No. 63E81046A18-A
5/25/67-UP

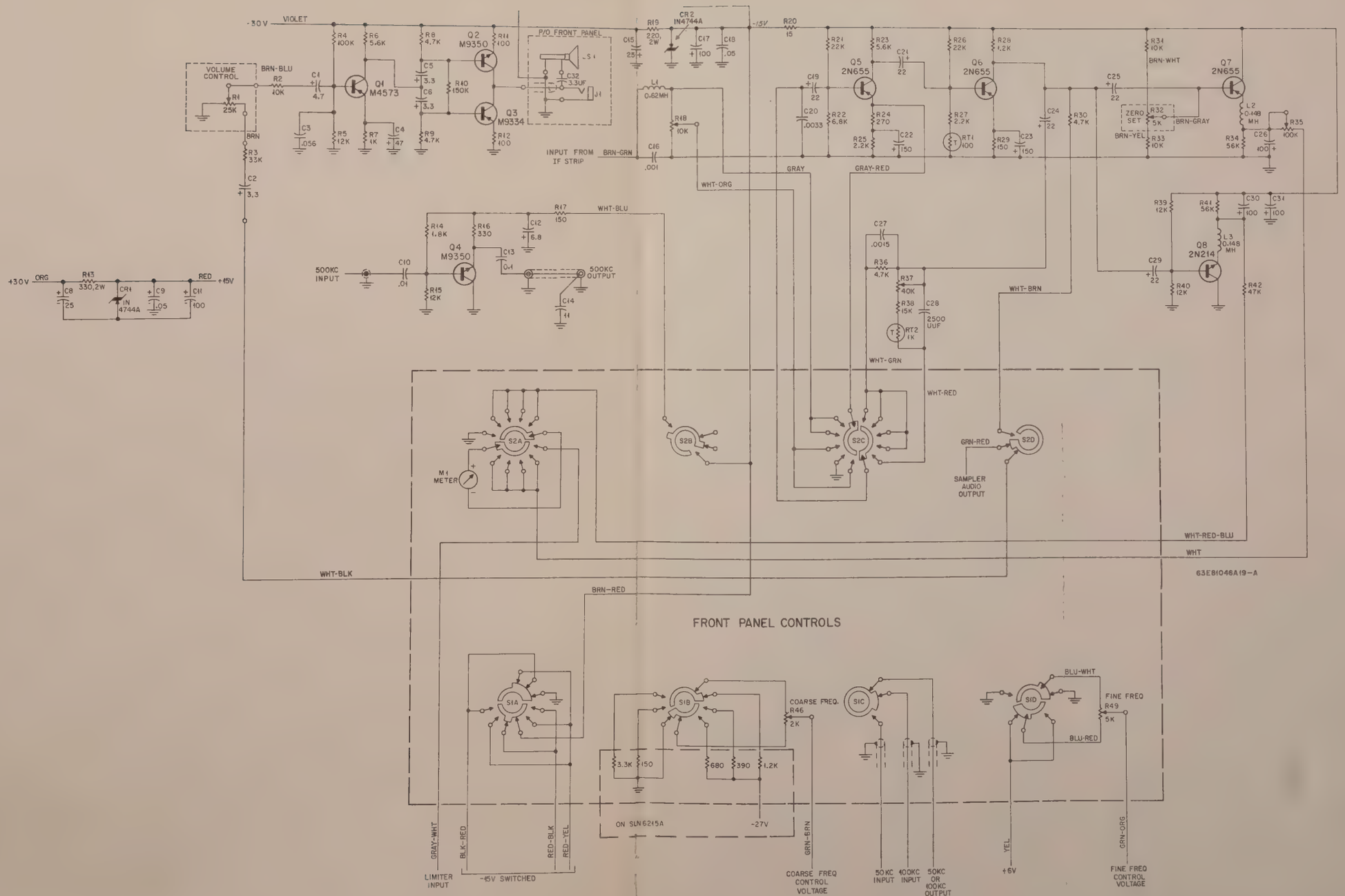
PARTS LIST

SLN6215A Sampler Board EPD-17466-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf ±10%; 500 v unl. stated
C1, 15	21D82537B08	49 ±3%; 300 v
C2	21K851845	11 ±5%; NP0
C3, 4, 17, 18	21K847743	8 ±.5% NP0
C5	21K840046	100
C7	21K840847	5 ±.5 uuf; NP0
C8, 11, 23	21C82372C07	.05 uf +80-20%; 25 v
C9	21D82428B32	0.01-30+70%; 100 v
C10	21C82372C01	0.1 uf +80-20%; 25 v
C12	23D82783B11	4.7 uf ±20%; 35 v
C13	23D82397D28	3.3 uf ±20%; 20 v
C14	23D83441B01	47 uf ±20%; 6 v
C16	21K865320	56 ±5%; NP0
C19	21C82187B14	1000; 100 v
C22	8D82905G11	0.22 uf; 50 v
C24	21C82372C05	0.2 +80-20%; 25 v
		SEMICONDUCTOR DEVICE, diode: (NOTE)
CR1	48D82256C20	silicon
CR2, 8, 9, 10, 11, 12	48D82420C11	silicon
CR3, 4, 5, 6	48D82420C14	silicon
CR7	48D82256C19	silicon
		TRANSISTOR: (NOTE)
Q1, 9	48R869452	P-N-P; M9452
Q2, 10	48R869454	N- channel insulated silicon field effect; type M9454 gate
Q3	48R869170	N-P-N; M9170
Q4, 6, 7, 8	48R869350	N-P-N; M9350
Q5	48R869334	P-N-P; type M9334
		RESISTOR, fixed: ±10%; 1/4 w unl. stated
R1	6S488090	56; 2 w
R2, 39	6S129235	1.2K
R3, 40	6S131594	27
R4, 13, 41	6S128685	22K
R5, 42	6S129229	180K
R6, 43	6S129233	47
R7, 27, 44, 55, 56	6S129225	10K
R11	6S129239	2.7 meg
R12	6K129860	56
R14	6S128686	8.2K
R15, 25	6S127806	27K
R16	6S129146	150K
R17	6S128599	680
R18	6S127804	4.7K
R20	6S127805	15K
R21, 47	18C82876B04	var.; 2K ±15%; 1/2 w @ 70°C
R22	6S129433	5.6K
R23	6S127802	1K
R24	6S128902	47K
R26, 34	6S128687	6.8K
R28, 29, 30, 33, 35, 38		Factory Selected
R31	6S128987	120K
R32	6S129145	82K
R36, 37, 51	6S129231	3.3K
R45, 52	6S129230	12K
R48, 50	6S129013	1 meg
R49	6S129144	68K
R51	18K864068	var; 10K ±15%
R53	18K861480	var; 100K ±20%; 1/8 w @ 40°C
R54	6S5554	390; 1/2 w
		VARISTOR:
RV1, 2	6B867370	36K ±10%; @ 25°C; 3.6 v

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Model SLN6217A Deviation Amplifier
Schematic Diagram
Motorola No. 63E81046A19-A
5/25/67-UP

REVISIONS

DIAG ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
A	SLN6217A	C7	REMOVED 23D82783B13, 15 uuf WAS CONNECTED BETWEEN Q2 COLLECTOR AND T1	Q2	DEVIATION AMP EPD-16461-A
		C32	ADDED 3.3 uf	-	NONE

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

SLN6217A Amplified Deviation Board EPD-16761-A

		CAPACITOR, fixed: uuf ±20%, unl. stated
C1	23D82783B11	4.7 uf; 35 v
C2, 5, 6, 32	23D82397D28	3.3 uf; 20 v
C3	23D82397D10	.056 uf ±10%; 35 v
C4	23D82397D21	47 uf; 6 v
C8, 15	23C82601A08	25 uf -10+150%; 50 v
C9, 18	21C82372C04	.05 uf +80-20%; 25 v
C10	21D82428B32	.01 uf -3+70% 100 v
C11, 17, 26, 30, 31	23D82783B04	100 uf; 25 v
C12	23D82397D23	6.8 uf; 20 v
C13	8K847099	0.1 uf; 150 v
C16	21C82187B20	1000 ±10%; 100 v
C19, 21, 24 25, 29	23D82397D16	22; 15 v
C20	21D82428B10	.0033 uf ±10%; 100 v
C22, 23	23D83441B02	150; 6 v
C27	21C82187B18	1500 ±10%; 100 v
C28	21K859773	2500 ±5%; 500 v
		SEMICONDUCTOR DEVICE, diode: (NOTE)
CR1, 2	48D82256C59	silicon
		COIL, RF: choke
L1	24K847940	300 turns; coded BRN-ORG
L2, 3	24C82190C07	150 turns
		TRANSISTOR: (NOTE)
Q1	48R134573	P-N-P; type M4573
Q2, 4	48R869350	N-P-N; type M9350
Q3	48R869334	P-N-P; type M9334
Q5, 6, 7	48A124327	P-N-P; type 2N655
Q8	48A124362	N-P-N; type 2N214
		RESISTOR, fixed: ±10%; 1/4 w unl. stated
R2, 31, 33	6S129225	10K
R3	6K129230	33K
R4	6K129226	100K
R5, 15, 39, 40	6S129230	12K
R6, 23	6S129433	5.6K
R7	6K127802	1K
R8, 9, 30, 36	6S127804	4.7K
R10	6S129146	150K
R11, 12	6S129753	100
R13	6S488037	330; 2 w
R14	6K129269	1.8K
R16	6K129775	330
R17, 29	6S129862	150
R19	6S488053	220; 2 w
R20	6S131377	15
R21, 26	6S128685	22K
R22	6S128687	6.8K
R24	6S131525	270 ±5%
R25, 27	6S128689	2.2K
R28	6S129235	1.2K
R34, 41	6S128684	56K ±5%
R35	18K861480	var.; 100K ±20%
R37	18B82567D02	var.; 40K ±20%
R38	6S127805	15K
R42	6S128902	47K
		THERMISTOR:
RT1	6B859701	disc. type; 100 ohms ±10%; @ 25°C
RT2	6B858402	rod type; 1000 ohms ±10%; @ 25°C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

P/O SLN6219A Chassis & Panel Kit EPD-16763-A

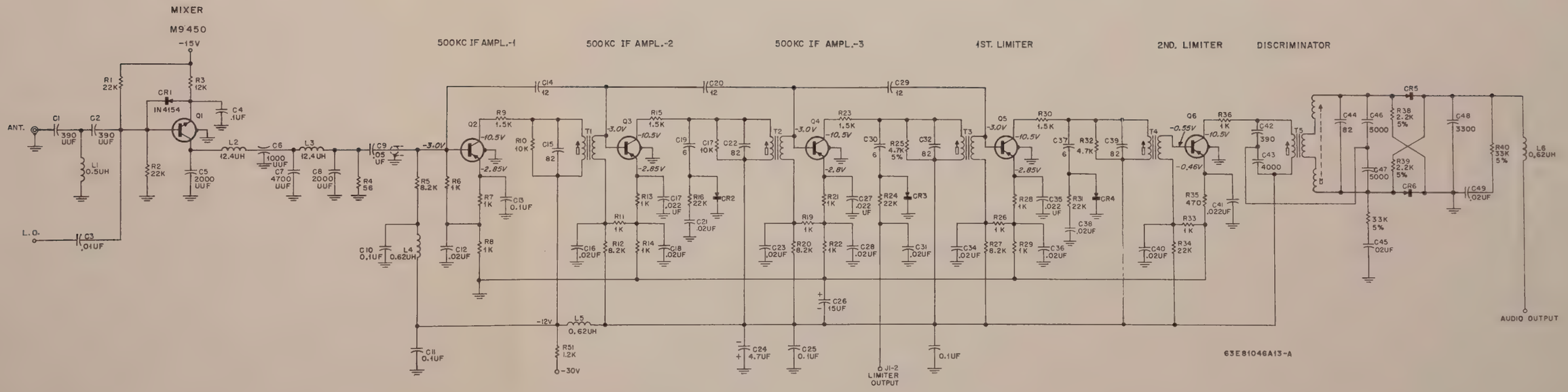
		CAPACITOR, fixed:
C14	21K851845	11 uuf ±10%; 100 v
C32	23D82397D28	3.3 uf ±20%; 20 v
		CONNECTOR, jack:
J1	9B83138B01	miniature; 1 form "B"
		METER
M1	72D83107E01	microammeter
		RESISTOR, variable ±20%: unl stated
R1	18C83930D04	25K
R18	18K864068	10K ±5%
R32	18C83930D03	5K
R46	18C83109E01	2K ±3%
R49	18D82700D01	5K
		SWITCH, rotary; 2 section
S1	40C83108E01	7 pole; 3 pos.
S2	40C83110E01	6 pole; 6 pos.

SKN6011A Intercable Kit EPD-16762-A

	1V80795A80	CABLE ASSEMBLY; coaxial: incl 28B844876 CONNECTOR coaxial; BNC type (2 req'd) and 30B475378 CABLE, coaxial; RG-58A/U; 9" req'd
	1V80795A81	CABLE ASSEMBLY; coaxial: incl 28B844876 CONNECTOR coaxial; BNC type (2 req'd) and 30B475378 CABLE coaxial; RG-58A/U; 14" req'd

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



NOTES:

1. UNLESS OTHERWISE STATED: ALL CAPACITOR VALUES ARE IN MICROMICROFARADS.
   ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/4WATT, K=1000.
2. VOLTAGE AND RESISTANCE MEASUREMENTS MADE USING A MOTOROLA DC MULTIMETER AND ARE REFERENCED TO CHASSIS UNDER THE FOLLOWING CONDITIONS:
   A. NO INPUT SIGNAL.
   B. FUNCTION SWITCH IN 500KC LIMITER POSITION.

MODEL TABLE

MODEL	SUFFIX	DESCRIPTION
SLN6058A		500KC IF BOARD
SLN6219A		CHASSIS AND PANEL KIT

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Model SLN6219A Chassis and Panel
Schematic Diagram
Motorola No. 63E81046A13-A
5/25/67-UP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	SLN6219A	R50	[illegible]	[illegible] OUTPUT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

P/O SLN6219A Chassis & Panel Kit EPD-16479-A

		CAPACITOR, fixed: unl. stated
C1, 2	21K865922	390; 500 v
C3	21D82428B06	.01 uf -30+70%; 100 v
C4	21C82372C03	.1 uf +80-20%; 25 v
C5, 8	21D82428B28	2000; 200 v
C6	21K861219	1000; 500 v
C7	21D82428B09	4700; 100 v
C9	21C82372C07	.05 uf +80-20%; 25 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48D82420C11	silicon (1N4154)
		COIL, RF:
L1	24K847870	choke; 0.5 uh
L2, 3	24K868709	choke; 12.4 uh
		TRANSISTOR:
Q1	48R869450	N-P-N; type M9450
		RESISTOR: ±10%; 1/4 w
R1, 2, 50	6S128685	22K
R3	6S129230	12K
R4	6S129860	56
R51	6S129235	1.2K
	NON-REFERENCED ITEMS	
	64C83100E01	PANEL, front
	13B83104E01	GRILLE, speaker
	9B82508E02	CONNECTOR, recept. fem; 24 cont.
	36B82628H08	KNOB, control: for 1/8" shaft
	36B82628H09	KNOB, control: with pointer; for 1/8" shaft
	36B82628H02	KNOB, control: for 1/4" shaft
	36B82628H03	KNOB, control: with pointer; for 1/4" shaft
	9B83918D01	CONNECTOR, receptacle: female 3 req'd
	9A855268	CONNECTOR, receptacle: female single cont; 3 req'd

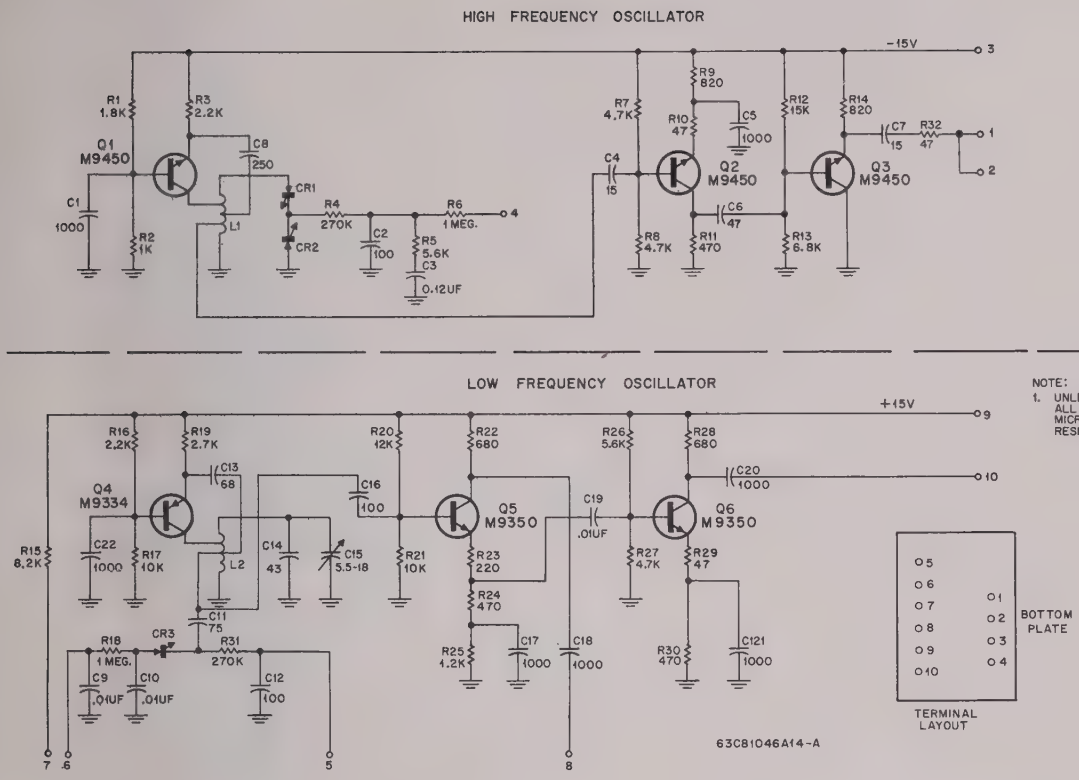
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

SLN6058A 455 KC Board EPD-16478-A

		CAPACITOR, fixed:
C10, 11, 13, 25, 33	8K844261	0.1 uf ±20%; 200 v
C12, 16, 18, 21, 23, 28, 31, 34, 36, 38, 40, 45, 49	21B82428B01	.02 uf -40+60%; 100 v
C14, 20, 29	21D82204B04	12 uuf ±0.5%; 500 v NP0
C15, 22, 32, 39, 44	21D82204B05	82 uuf ±5%; 500 v; N2200
C17, 27, 35, 41	8K852472	.022 uf ±10%; 200 v
C19, 30, 37	21D82204B03	6 uuf ±0.5%; 500 v; NP0
C24	23K865137	4.7 uf ±20%; 25 v
C26	23K865136	15 uf ±20%; 25 v
C42	21K859945	390 uuf ±5%; 500 v
C43	21K863396	4000 uuf ±1%; 500 v
C46, 47	21K857481	5000 uuf ±5%; 100 v
C48	8K861939	3300 uuf ±10%; 100 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR2, 3, 4	48C82178A01	germanium
CR5, 6	48C855216	germanium
		COIL, RF:
L4, 5, 6	24K864737	choke: 0.62 uh; BLK-BRN
L7	24K861818	discriminator; YEL; incl. 1K867236 CORE, tuning
		TRANSISTOR: (SEE NOTE)
Q2, 3, 4, 5, 6	48A134524	P-N-P; type 2N1638
		RESISTOR: ±10%; 1/4 w; unl. stated
R5, 12, 20, 27	6K128686	8.2K
R6, 7, 8, 11, 13, 14, 19, 21, 22, 26, 28, 29, 33, 36	6K127802	1K
R9, 15, 23, 30	6K127803	1.5K
R10, 17	6K129225	10K
R16, 24, 31, 34	6K128685	22K
R25, 32	6K129669	4.7K ±5%
R35	6R127801	470
R37, 40	6K129526	33K ±5%
R38, 39	6K129804	2.2K ±5%
		TRANSFORMER, IF:
T1, 2, 3, 4	24B859891	coded GRN; includes 1K867236 CORE, tuning
T5	24C82842D02	discriminator

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Model SLN6220A Oscillators
Schematic Diagram
Motorola No. 63C81046A14-A
5/25/67-UP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	SLN6220A	C13	WAS 21K850118, 100 uuf	Q4 EMITTER
		C14	WAS 21D82537B07	PARTS LIST
		C15	WAS 20C82399D08, 3-10 uuf	LOW FREQ. OSC
		R27	WAS 6S129669, 4.7K	Q6 BASE

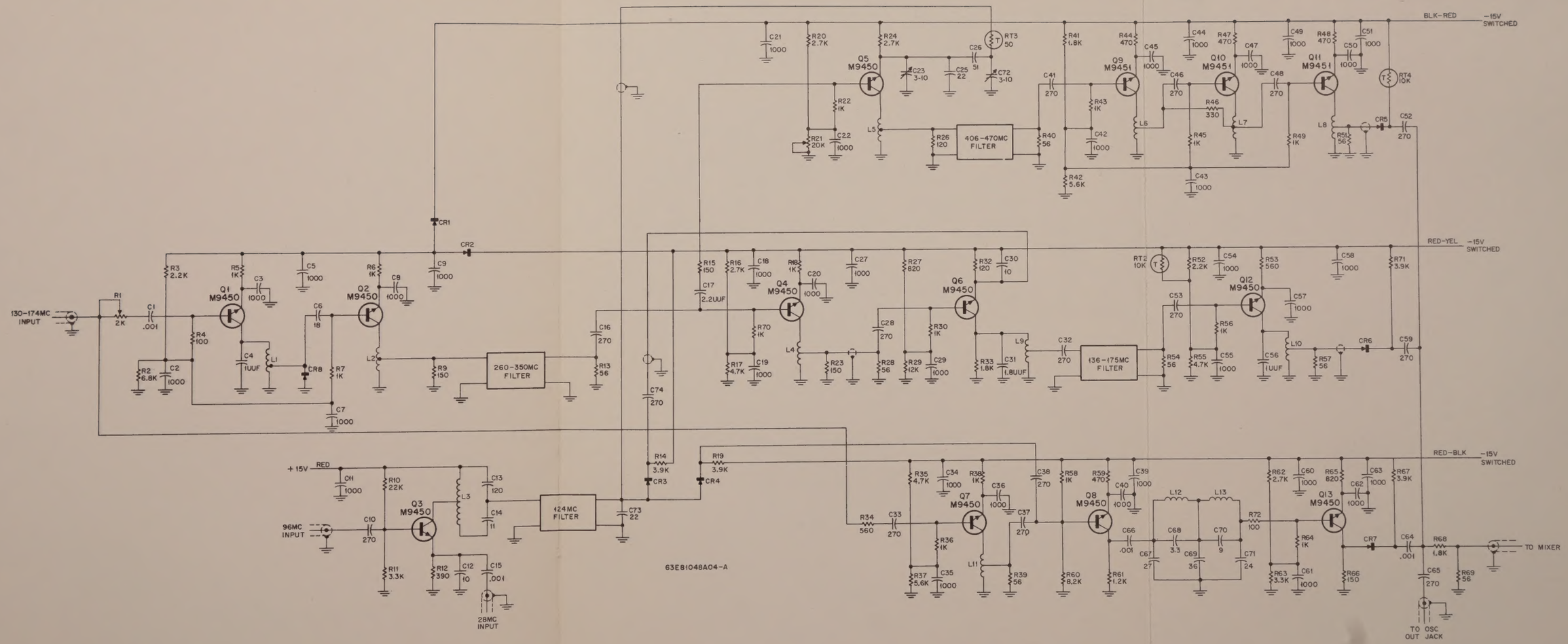
PARTS LIST

SLN6220 Oscillator EPD-16481-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf unl. stated
C1, 5, 17, 21, 22	21C83191A01	1000 +100-0%; 500 v
C2, 12, 16	21K850118	100 ±5%; 500 v
C3	8D82905G09	.12 uf; 50 v
C4, 7	21K859899	15 ±5%; 250 v; NP0
C6	21C82450B12	4.7 ±5%; 500 v
C8	21K861602	250 ±3%; 300 v
C9, 10, 19	21D82428B32	.01 uf; 100 v
C11	21K859938	75 ±5%; 500 v
C13	21K873266	68 ±2%; 500 v
C14	21K859453	43 ±5% 500 v; N75
C15	20C82399D04	var; 5.5-18; 200 v
C18, 20	21D82537B16	1000 ±5%; 100 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1, 2	48C83215E01	silicon
CR3	48C82190H03	silicon
		COIL:
L1	24B83210E01	H.F.; 2-1/2 turns
L2	24B82890D12	R.F.; 28 mc
		TRANSISTOR: (SEE NOTE)
Q1, 2, 3	48R869450	N-P-N; type M9450
Q4	48R869334	P-N-P; type M9334
Q5, 6	48R869350	N-P-N; type M9350
		RESISTOR: ±5%; 1/4 w
R1	6S129820	1.8K
R2	6S129805	1K
R3, 16	6S129804	2.2K
R4, 31	6S131838	270K
R5, 26	6S129982	5.6K
R6, 18	6S129189	1 meg
R7, 8	6S129669	4.7K
R9, 14	6S129818	820
R10, 29	6S131274	47
R11, 24, 30	6S129709	470
R12	6S129236	15K
R13	6S129237	6.8K
R15	6S129983	8.2K
R17, 21	6S129668	10K
R19	6S129707	2.7K
R20	6S129887	12K
R22, 28	6S129984	680
R23	6S131275	220
R25	6S129708	1.2K
NON-REFERENCED ITEMS		
	9B83918D01	CONNECTOR, receptacle: cloverleaf; 14 used for high frequency; 20 used for low frequency
	29C83223B02	TERMINAL, insulated

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Model SLN1002A RF and Filter Module
Schematic Diagram
Motorola No. 63E81048A04-A
5/25/67-UP

PARTS LIST

SLN6218A RF Module Kit — EPD-18925-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf ±5%; 500 v unl stated
C1, 15, 26, 64, 66	21C82187B14	1000 ±10%; 100 v
C2, 3, 5, 7, 8, 9, 11, 18, 19, 20, 21, 22, 27, 29, 34, 35, 36, 39, 40, 42, 43, 44, 45, 47, 49, 50, 51, 54, 55, 57, 58, 60, 61, 62, 63	21C83191A01	1000 +100-0%
C4, 56	21K864518	1 ±10%
C6	21S122235	18 +5%; NP0
C10, 16, 28, 32, 33, 37, 38, 41, 46, 48, 52, 53, 59, 65, 74	21D82187B22	270 ±10%; 200 v
C12, 30	21D82355B26	10 ±.25; ±30%; NP0
C13	21K840713	120
C14	21K851845	11; NP0
C23, 72	20C82399D08	3-10; 200 v; NP0
C24	21C82450B05	.24 ±10%
C25, 73	21R124554	22 ±5%; 200 v
C31	21C82450B30	1.8
C67	21R410089	27 ±10%
C68	21K868910	3.3 ±0.25 uuf; NP0
C69	21K852185	36; NP0
C70	21K859642	9; N150
C71	21K840365	24; NP0
		SEMICONDUCTOR DEVICE, diode: (NOTE)
CR1, 2	48C82392B03	silicon
CR3, 4, 5, 6, 7, 8	48D82420C11	silicon
		COIL, RF:
L1	24B83211E07	choke; 12 turns; BLU
L2, 11	24B83211E04	choke; 12 turns; YEL
L3	24D82597C24	5 turns; VIO/BLK
L4, 5	24B83211E06	choke; 8 turns; VIO
L6, 7, 8	24B83211E03	choke; 6 turns; GRN
L9, 10	24B83211E05	choke; 24 turns; ORG
L12	24B83211E01	choke; 25 turns; BLK
L13	24B83211E02	choke; 20 turns; WHT
		TRANSISTOR: N-P-N (NOTE)
Q1, 2, 3, 4, 5, 6, 7, 8, 12, 13	48R869450	type M9450
Q9, 10, 11	48K869451	type M9451
		RESISTOR, fixed: ±10%; 1/4 w unl stated
R1	18C82876B04	var; 2K
R2	6S128687	6.8K
R3, 52	6S128689	2.2K
R4, 72	6S129753	100
R5, 6, 7, 18, 22, 30, 36, 38, 43, 45, 49, 56, 58, 64, 70	6S127802	1K
R9, 15, 23, 66	6S129862	150
R10	6S128685	22K
R12	6S129863	390
R13, 26, 28, 39, 40, 51, 54, 57, 69	6S129860	56
R14, 19, 50, 67, 71	6S129232	3.9K
R16, 20, 24, 62	6S128688	2.7K
R17, 35, 55	6S127804	4.7K
R21	18B82567D01	var; 20K
R27, 65	6S129432	820
R29	6S129230	12K
R32	6S129617	120
R33, 44, 47, 48, 59	6S127801	470
R34, 53	6S129620	560
R37, 42	6S129433	5.6K
R41, 68	6S129269	1.8K
R46	6S129775	330
R60	6S128686	8.2K
R61	6S129235	1.2K

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		THERMISTOR: wafer type
RT1, 3	6B861477	50 ±10%
RT2, 4	6B82069A01	10K ±10%

Numeric Filters — EPD-16751-O

		FILTER, bandpass:
	SFD6000A	124 mc
	SFD6001A	136-175 mc
	SFD6002A	260-350 mc
	SFE6000A	406-470 mc

NOTE:

Replacement diodes and transistors must be oredred by Motorola part number only for optimum performance.

MP MASTER
MA36327